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PROF ALEXANDER DMITRIYEVICH PETROV

Petrov was born 16 August 1895. He has been connected with the Academy of Sciences of the USSR for 20 years and is head of the Laboratory of Pyrogenic Processes.

In 1922 he completed his studies in the University of Leningrad's chemistry department where he worked under Prof M. C. Vrevskiy.

Until 1925 Petrov taught organic and technical chemistry in the Military-Technical Academy. In 1925 he began to do research in the high-pressure laboratory of the Academy of Sciences (later redesignated the Laboratory of Pyrogenic Processes). At first he was an assistant, then senior chemist, and in 1930 he became head of the laboratory.

All of his many investigations are related in some way to large national economic problems or to the study of the natural resources and the productive forces of the USSR. His work on the development of the motor-fuel and lubricating oil industry and on the creation of new production processes of heavy organic synthesis was of economic as well as purely scientific value.

Petrov has written the following monographs: Organic Synthesis, Artificial Liquid Fuel, Advancements in the Chemistry of the Aliphatic Hydrocarbons, Outlines of the Chemistry of Motor Fuels and Lubricating Oils, Trends in the Development of the Industry for Synthesizing Aliphatic Compounds.

Petrov is one of the greatest Soviet experts on the chemistry of hydrocarbons as components of motor fuels and lubricating oils and as raw material for organic synthesis. His research was always connected with this basic problem. The first of his investigations were performed in the high-pressure laboratory and involved the transformation of organic oxygen compounds under high temperatures and pressures with aluminum oxide as the catalytic agent.

- 1 -

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His early work discloses the direction of his chemical interests, which include the chemistry of petroleum hydrocarbons, the chemistry of their formation and transformation, chemical problems of motor fuel and lubricating oils, and the synthesis of organic compounds on the basis of petroleum, natural, cracking, and acetylene gases.

His name stands high in the list of men who did pioneer research in the field of high-pressure catalytic hydrogenation. He did much to call attention to the importance of catalytic hydrogenation of coal, petroleum, and shale tar and also stressed the importance of the stabilization of gasolines by hydrogenation and of other reactions under high hydrogen pressures. He further indicated to what specific uses they might be put in order to utilize the natural resources of Siberia and Central Asia. He also advocated methane cracking as a source of hydrogen and of acetylene, in which the USSR is deficient.

Petrov did much work on hydrocarbon polymerization and isomerization, the syntheses of lubricating oils from ethylene with aluminum chloride under high pressures and at various temperatures, and the investigation of the chemical composition and properties of the synthesized oils. He devoted considerable attention to the refining of lubricating oils by electrical means. His research in the use of electricity in oil processing insured the possibility of obtaining high-quality products at low cost.

For some years now he has been working on the catalytic hydropolymerization of acetylene. These experiments are important since they lead directly to the synthesis of the most valuable component of motor fuels, namely, isoctane.

His labors on the isomerization of paraffin and olefinic hydrocarbons disclosed the fact that hexene in the presence of phosphoric acid isomerizes into dimethyl-ethyl ethylene and in the presence of zinc chloride into tetramethyl-ethylene.

Petrov is still working on the synthesis of the individual hydrocarbons possessing different properties and different molecular weights. He is also studying the physical constants of these hydrocarbons and their relationships with chemical structure. There are more than 60 of these hydrocarbons, many of them synthesized for the first time. He succeeded in establishing rules which relate the extent and nature of the natural geometry of these hydrocarbons with their antiknock properties and with the temperatures of solidification.

Petrov's attempt to synthesize hydrocarbons of different structures (isomers) led him into the field of the mechanism and application of the Grignard reaction. He showed that the complex esters of organic acids, reacting with secondary and tertiary halogen magnesium alkyls, do not give tertiary alcohol as one might expect, but symmetrical ketones, both of whose radicals correspond to the acid of a given complex ester. This new "anomaly" of the Grignard reaction was studied in detail. He also studied the action of secondary and tertiary halogen magnesium alkyls on the esters of dibasic acids such as sebacic, azelaic, and suberic. In this case, not di-tertiary but di-secondary glycols are formed through the reducing action of the Grignard reaction. This new "anomaly" made it possible to synthesize as yet unknown diene hydrocarbons.

In addition to his scientific activity, Petrov has been engaging in pedagogical work in the Gorky State University and the Moscow Chemical-Technical Institute imeni D. I. Mendeleyev. He also takes part in the work of the National Commissariats of the Chemical and Petroleum Industries and of other institutions.

For some years he was a consultant for the chemical institutes in the Azerbaydzhan, Georgian and Armenian affiliates of the Academy of Sciences. For his research works, Petrov received the order of the Red Banner of Labor.

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- 2 -

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